

**PCT**WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau

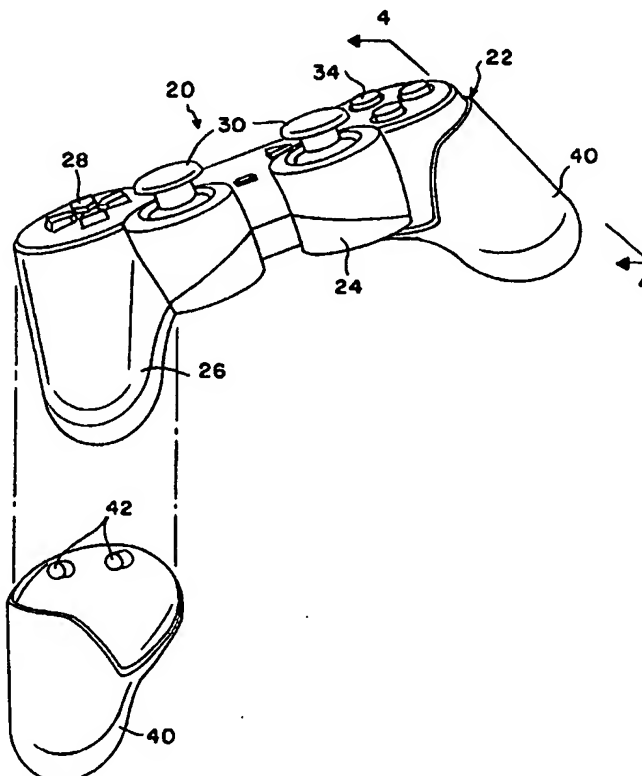
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> : <b>A63B 71/00</b>		A1	(11) International Publication Number: <b>WO 99/36136</b>
			(43) International Publication Date: 22 July 1999 (22.07.99)
(21) International Application Number: PCT/US99/00171		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: 13 January 1999 (13.01.99)		<p><b>Published</b> <i>With international search report.</i></p>	
(30) Priority Data: 60/071,438 14 January 1998 (14.01.98) US 60/071,585 15 January 1998 (15.01.98) US			
(71) Applicant: GRYPISOFT, INC. [US/US]; Suite 1016, 255 South Grand Avenue, Los Angeles, CA 90012 (US).			
(72) Inventors: WADA, Stanley, H.; 5688 Etiwanda Avenue #203, Tarzana, CA 91356 (US). YI, John; 255 South Grand Avenue #1016, Los Angeles, CA 90013 (US).			
(74) Agent: KELLEY, Scott, W.; Kelly Bauersfeld Lowry & Kelley, LLP, Suite 1650, 6320 Canoga Avenue, Woodland Hills, CA 91367 (US).			

(54) Title: APPARATUS FOR REDUCING REPETITIVE STRESS INJURIES WITH HAND-MANIPULATED ELECTRONIC DEVICES

## (57) Abstract

An apparatus is provided for reducing repetitive stress injuries while utilizing a hand-manipulated electronic device such as a video game controller (20). The video game controller (20) will typically have a body (24) including game controllers actuatable by a user's fingers, and hand grips (26) extending therefrom. Cushioned pads, including hand pads (40) and additional pads configured to overlie one or more game controllers on the body, are provided which conform in shape to the surfaces of the video game controller that are most likely to be grasped and/or pressed by a user's hands and/or fingers. The hand pads may be adhesively secured in place to the hand grips or they may comprise sheaths which receive the hand grips therein. The pads which overlie the game controllers are typically adhesively secured to the body adjacent to the game controller without attachment directly to the controller itself.



**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

APPARATUS FOR REDUCING REPETITIVE STRESS  
INJURIES WITH HAND-MANIPULATED ELECTRONIC DEVICES

BACKGROUND OF THE INVENTION

This invention relates generally to apparatus and systems for reducing repetitive stress injuries. More specifically, the present invention relates to apparatus utilized in connection with hand-manipulated electronic devices to eliminate such repetitive stress injuries by providing cushioned pads on selected surfaces intended to be grasped and/or pressed by a user's hands and/or fingers.

Most people have occasion to utilize hand-manipulated electronic devices. One the most popular and often used of such devices is that class known as the video game controller. Video game controllers typically include a rigid housing, which may include hand grips, and finger tip controls such as buttons, a directional grid and/or a joy stick. Video game controllers are typically intended to be held by both hands so that the game controllers (buttons) and/or control levers may be manipulated by the thumbs and fingers of the user.

It has been found that when handling a typical video game controller over an extended period of time, the hands and fingers of the user become sore and cramped due to repetitive and/or constant pressure applied against the controller while playing the video game. Moreover, the rigid housing and grips provide little protection for the video game controller should it be dropped.

The aforementioned problems associated with extended use of video game controllers has been addressed in the past by providing padded gloves for the user. See, for example, U.S. Patent Nos. 4,519,097 and Des. 280,053. The problem with such an approach is that placing the gloves on and off a user's hand is time consuming and often undesirable in a video game environment wherein the action is intense and fast paced. Moreover, sharing of gloves is deemed undesirable, since gloves will tend to absorb a user's sweat and body odors.

An attempt has been made further to provide an ergonomic handle for a generally rectangular game controller as shown in U.S. Patent No. 5,046,739. While the approach shown there could be desirable for the generally rectangular hand held device as illustrated, the provision of additional handles to modern video game controllers and other electronic devices (which have already been engineered for ergonomic comfort, is deemed undesirable.

Accordingly, there is a need for an apparatus for reducing repetitive stress injuries with hand-manipulated electronic devices such as video game controllers, flight sticks, notebook computers and computer mice, which can be conveniently and selectively applied to surfaces intended to be grasped and/or pressed by user's hands and/or fingers during use of the device. Additionally, such an apparatus is needed which is easy to use, of simplified construction and, therefore, relatively inexpensive. Moreover, an apparatus is needed which can be applied to an electronic device, such as a video game controller, to protect a user's hands and/or fingers in the regions of the hand grip, the game controllers, and other surfaces selected by the user. The present invention fulfills these needs and provides other related advantages.

#### SUMMARY OF THE INVENTION

The present invention resides in an apparatus for reducing repetitive stress injuries. The apparatus comprises, generally, a hand-manipulated electronic device which has selected surfaces intended to be grasped and/or pressed by a user's hands and/or fingers, pad means configured to conform to the shape of the selected surfaces of the electronic device, and means for securing at least a portion of the pad means to the electronic device so as to position the pad means over the selected surfaces thereof. The pad means is provided a rubber-like cushioned exterior surface to make use of the electronic device more comfortable for a user.

In one preferred form of the invention, the electronic device comprises a video game controller having a body and a pair of hand grips

extending therefrom. The body typically includes game controllers actuable by a user's fingers. The pad means may include hand pads fixed to selected surfaces of the hand grips and/or pads fixed to the body over at least one of the game controllers.

The hand pads may be manufactured for releasable securement to the hand grips by means of a frictional fit, or they may be simply adhesively secured to the hand grips. In the case where the hand pads are intended to be releasably secured to the hand grip, the hand pads comprise sheaths which receive the hand grips therein. The sheaths may be individual units for each hand grip, or they may be interconnected to one another to help secure them in place on the video game controller. Retention tabs may be provided within the sheaths to fit into recesses of the video game controller to help hold the hand grips in place.

Cushioning pads provided over the game controllers typically include an adhesive for securing the pad to the body of the video game controller adjacent to the selected game controller without attachment directly to the game controller itself. When it is desirable to provide a pad over a game controller such as a joy stick, the pad is typically frictionally fit thereto. As shown in the accompanying drawings, an adhesively applied game controller pad as well as the frictionally applied joy stick pad may be interconnected and secured to the video game controller as a single unit.

The cushioning pads may be advantageously applied to many other types of hand-manipulated electronic devices, such as flight sticks, notebook computers and computer mice.

Other features and advantages of the present invention will become apparent from the following more detailed description, taken in conjunction with the accompanying drawings which illustrate, by way of example, the principles of the invention.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings illustrate the invention. In such drawings:

FIGURE 1 is a top and rear side perspective view of an exemplary video game controller having a body, a pair of hand grips and several different types of game controllers on the body;

FIGURE 2 is a bottom and front perspective view of the video game controller shown in FIG. 1;

FIGURE 3 is a perspective view of the video game controller of FIGS. 1 and 2, illustrating application of a pair of sheath-like hand pads to the hand grips;

FIGURE 4 is an enlarged, partially sectional view taken generally along the line 4-4 of FIG. 3, illustrating the manner in which a sheath-like hand pad is frictionally secured to a respective hand grip by means of, among other things, retention tabs which fit within recesses provided on the underside of the game controller;

FIGURE 5 is a top plan view of the video game controller of FIGS. 1 and 2, wherein an alternative type of frictionally retained hand pad is secured over each hand grip, the hand pads being attached to one another so as to assist in the securement of the hand pad sheaths to the hand grips;

FIGURE 6 is a bottom plan view of the video game controller having the hand pads applied to the hand grips, as illustrated in FIG. 5;

FIGURE 7 is an enlarged fragmented perspective view of one hand grip of the video game controller illustrated in FIGS. 1 and 2, wherein separate adhesively secured hand pads are applied to the hand grip at selected surfaces intended to be grasped and/or pressed by a user's hands, and further illustrating application of a frictionally retained hand pad over a joy stick;

FIGURE 8 is an enlarged sectional view taken generally along the line 8-8 of FIG. 7;

FIGURE 9 is an enlarged sectional view taken generally along the line 9-9 of FIG. 7;

FIGURE 10 is a top and side perspective view of another type of cushioned pad configured for placement over the directional control buttons and adjacent toggle switch or joy stick shown on the upper left surface of the body of the video game controller of FIGS. 1, 3 and 5;

FIGURE 11 is a top and side perspective view of another type of cushioned pad intended to be placed over the game controllers on the upper right surface of the video game controller shown in FIGS. 1, 3 and 5;

FIGURE 12 is an enlarged sectional view taken generally along the line 12-12 of FIG. 11;

FIGURE 13 illustrates the manner of applying adhesively secured cushioned pads to selected surfaces of a flight stick-type electronic device;

FIGURE 14 is a perspective view similar to FIG. 13, illustrating the cushioned pads as applied to the selected surfaces;

FIGURE 15 is a perspective view of an exemplary notebook computer and, exploded therefrom, a cushioned pad intended to be adhesively secured to a selected surface of the notebook computer on which the user will place his or her wrists;

FIGURE 16 is a perspective view similar to FIG. 15, illustrating the cushioned pad in place on the notebook computer;

FIGURE 17 is an exploded perspective view illustrating a typical computer mouse and three adhesively backed cushioned pads intended for application on the selected surfaces of the mouse; and

FIGURE 18 is a perspective view similar to that shown in FIG. 17, showing the cushioned pads as applied to the selected surfaces of the computer mouse.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in the drawings for purposes of illustration, the present invention is concerned with an apparatus for reducing repetitive stress injuries with hand-manipulated electronic devices such as the exemplary video game controller generally designed by the reference number 20. The video game controller 20 is of the type typically associated with the Sony Play Station™ electronic game system, and includes a rigid plastic outer housing 22 which defines a game controller body 24 and a pair of hand grips 26. Of course, the invention relates to other types of controllers, such as those for Nintendo 64™, Sega Dreamcast™ and Microsoft Sidewinder™ systems. An upper surface of the body 24 includes a number of game controllers, such as the directional

controllers 28, a pair of joy sticks or toggle controls 30, two directional arrows 32, and four multi-purpose game controller buttons 34. As shown in FIGS. 5 and 6, the video game controller 20 is electronically connected to a game processor by means of an electronic cable 36. With reference to FIG. 2, the undersurface of the video game controller 20 contains no video game controller buttons, but has recesses 38 which are molded into the outer housing 22 to provide wells for screws (not shown) utilized to hold various parts of the outer housing 22 together.

In use, the video game controller 20 is grasped by each of the hand grips 26 in such a manner as to permit the user to manipulate the directional controllers 28, the joy sticks 30, the directional arrows 32 and the multipurpose game controller buttons 34 by means of the user's thumb and fingers. However, as discussed briefly above, prolonged use of the video game controller 20 often results in soreness and fatigue to the user's hands and/or fingers and may result in repetitive stress injuries.

In accordance with the present invention, and with reference initially to FIGS. 3 and 4, hand pads 40 are provided which are configured to ensheath a portion of the hand grips 26 of the video game controller 20. The hand pads 40, like the other pads to be discussed hereinafter, are configured to conform to the shape of the selected surface of the video game controller 20, and preferably has a rubber-like cushioned exterior surface for comfort. The hand pads 40 illustrated are simply pushed over the ends of the hand grips 26 and are frictionally secured in place. Moreover, retention tabs 42 are provided which extend inwardly from the cushioning outer or exterior surface of the hand pads 40, and are positioned to be inserted within one or more of the recesses 38 provided in the underside of the outer housing 22. These retention tabs 42, which are integrally molded with the hand pads 40, serve to further secure the hand pads 40 to the hand grips 26.

Preferably, the hand pads 40 are formed of a foam rubber sheet or other suitable soft material that is comfortable to grip by the user of the video game controller 20, and also capable of absorbing sweat away from the hands caused by extended play. In this regard, sweating of the palms of the user's hands decreases his or her grip on the video game controller 20 and affects performance of the user.



As illustrated in FIGS. 5 and 6, the hand pads 40 may be modified so as to include a tether member 44 which links the hand pads 40 together. As shown, the hand pads 40 are stretched over the hand grips 26 as discussed above in connection with FIGS. 3 and 4, and the tether member 44 stretches over the electronic cable 36 to further insure secure positioning of the hand pads 40 to the hand grips 26. In this particular embodiment, the hand pads 40 may be constructed with or without the retention tabs 42, since the tether member 44 will serve to adequately fix the hand pads 40 in place during use of the video game controller.

Referring now to FIGS. 7-9, the hand pads 40 may be replaced with one or more adhesively securable pads 46. In this embodiment, three pads are utilized which collectively conform to the shape of the hand grip 26. Each of the pads 46 includes a rubber-like cushioned exterior surface 48, and a sweat-absorbing liner 50 which immediately underlies the exterior surface 48. An adhesive 52 underlies the sweat-absorbing liner 50, and a protective release film 54 (such as releasable paper) overlies the adhesive 52 and is removed immediately prior to applying the adhesively securable pads 46 to the selected surface of the hand grip 26. Also shown in FIGS. 7 and 9 is a pad 56 for a finger actuated joy stick or toggle lever. The pad 56 is simply formed of a resiliently deformable cushioned material so as to fit over the finger engaging portion of the joy stick analog control 30.

FIGS. 10-12 illustrate other types of pads 58 and 60 that may be fixed to the body 24 of the video game controller 20 over selected controls disposed on the upper surface of the body 24. More particularly, FIG. 10 illustrates a pad 58 that may be adhesively secured, in part, over the directional controllers 28 as well as frictionally secured over the adjacent joy stick 30 of the video game controller 20. FIG. 11 illustrates another type of pad 60 that may be adhesively secured to an upper surface of the outer housing adjacent to the multipurpose game controller buttons 34. In both of these illustrated embodiments, the pads 58 and 60 include an adhesive 62 which secures the pad to the body 24 adjacent to the respective directional controllers 28 or multi-purpose game controller buttons 34 without attaching the pads 58 and 60 directly to the game control buttons. This helps to insure proper operation of the buttons during use.

FIGS. 13-18 illustrate other types of electronic devices wherein the invention may be advantageously practiced. Specifically, FIGS. 13 and 14 illustrate the use of adhesively securable pads 62 (similar to the pads 46) that may be secured to selected surfaces of a hand-held flight stick 64. FIGS. 15 and 16 illustrate another adhesively securable pad 66 (similar to the pads 46) that may be applied to an upper surface of a notebook computer 68 where the user's wrists typically rest. FIGS. 17 and 18 similarly illustrate three pads 70 that may be secured to the upper surface of a computer mouse 72.

From the foregoing it will be appreciated that the pads, when utilized in connection with a selected surface intended to be grasped and/or pressed by a user's hands and/or fingers of an electronic device, advantageously increases comfort and is capable of reducing repetitive stress injuries. When adhesive-backed padded material is utilized in the pads, the padded material is die-cut to various shapes to conform to the shape of the selected surface of the electronic device to which the pad will be applied. If desired, the adhesive may be selected so as to permit its temporary securement to the electronic device and subsequent removal therefrom when the device is not in use. The cushion material should be of sufficient durability to resist multiple contacts to function buttons, pads or keys of the electronic device and yet maintain full functionality of the device without degradation to the pads. It will also be appreciated that the cushion material of the pads will assist users of electronic devices such as the video game controller 20 in increasing the player's grip on the game controller caused by perspiration of the hand.

Moreover, the cushion material of the grips may be deformable so as to better conform to the shape of the user's hands and fingers. Such deformable cushioned materials for the pads, as well as the die-cut and molded pads illustrated may be provided the electronic device as an original equipment item rather than an after-market item as shown in the drawings. All such embodiments are included within the scope of the present invention.

Although several embodiments of the invention have been described in detail for purposes of illustration, various modifications of each may be made without departing from the spirit and scope of the invention.

Accordingly, the invention is not to be limited, except as by the appended claims.

We Claim:

1. An apparatus for reducing repetitive stress injuries, comprising:  
a hand-manipulated electronic device having a selected surface intended to be grasped and/or pressed by a user's hands and/or fingers;  
pad means configured to conform to the shape of the selected surface of the electronic device, and having a rubber-like cushioned exterior surface; and  
means for securing at least a portion of an interior surface of the pad means to the electronic device so as to position the pad means over the selected surface of the electronic device.
2. The apparatus of claim 1, wherein the pad means includes a sweat absorbing liner interiorly adjacent to the rubber-like cushioned exterior surface.
3. The apparatus of claim 1, wherein the electronic device comprises a video game controller having a body and hand grips extending therefrom, and wherein the pad means includes hand pads fixed to selected surfaces of the hand grips.
4. The apparatus of claim 3, wherein the hand pads are adhesively secured to the hand grips.
5. The apparatus of claim 3, wherein the hand pads are releasably secured to the hand grips by means of a frictional fit.
6. The apparatus of claim 5, wherein the hand pads comprise sheaths which receive therein the hand grips.
7. The apparatus of claim 6, wherein the sheaths include retention tabs insertable into a portion of the respective hand grips.

8. The apparatus of claim 6, wherein the hand pads are interconnected to one another.

9. The apparatus of claim 1, wherein the electronic device comprises a video game controller having a body grasped by a user, the body including game controllers actuatable by a users fingers, and wherein the pad means includes a pad fixed to the body over at least one of the game controllers.

10. The apparatus of claim 9, wherein the game controller comprises a joy stick, and the pad is frictionally fit over the joy stick.

11. The apparatus of claim 9, wherein the pad includes an adhesive for securing the pad to the body adjacent to the at least one game controller without attachment directly to the game controller.

12. The apparatus of claim 11, wherein the pad includes a protective release film disposed over the adhesive that is removed prior to adhering the pad to the body.

13. The apparatus of claim 12, wherein the game controller comprises a joy stick, and the pad is frictionally fit over the joy stick.

14. An apparatus for reducing repetitive stress injuries, comprising:

a video game controller having a body and hand grips extending therefrom, the body and hand grips including selected surfaces intended to be grasped and/or pressed by a user's hands and/or fingers;

pad means configured to conform to the shape of at least one of the selected surfaces of the electronic device and having a rubber-like cushioned exterior surface, the pad means including hand pads fixed to selected surfaces of the hand grips; and

means for securing at least a portion of an interior surface of the pad means to the electronic device so as to position the pad means over the selected surface of the electronic device.

15. The apparatus of claim 14, wherein the hand pads are adhesively secured to the hand grips.

16. The apparatus of claim 14, wherein the hand pads are releasably secured to the hand grips by means of a frictional fit, and the hand pads comprise sheaths which receive therein the hand grips.

17. The apparatus of claim 16, wherein the sheaths include retention tabs insertable into a portion of the respective hand grips.

18. The apparatus of claim 16, wherein the hand pad sheaths are interconnected to one another.

19. The apparatus of claim 14, wherein the body further includes game controllers actuable by a user's fingers, and wherein the pad means includes a pad adhesively secured to the body over at least one of the game controllers.

20. The apparatus of claim 19, wherein the game controller comprises a joy stick, and the pad is frictionally fit over the joy stick.

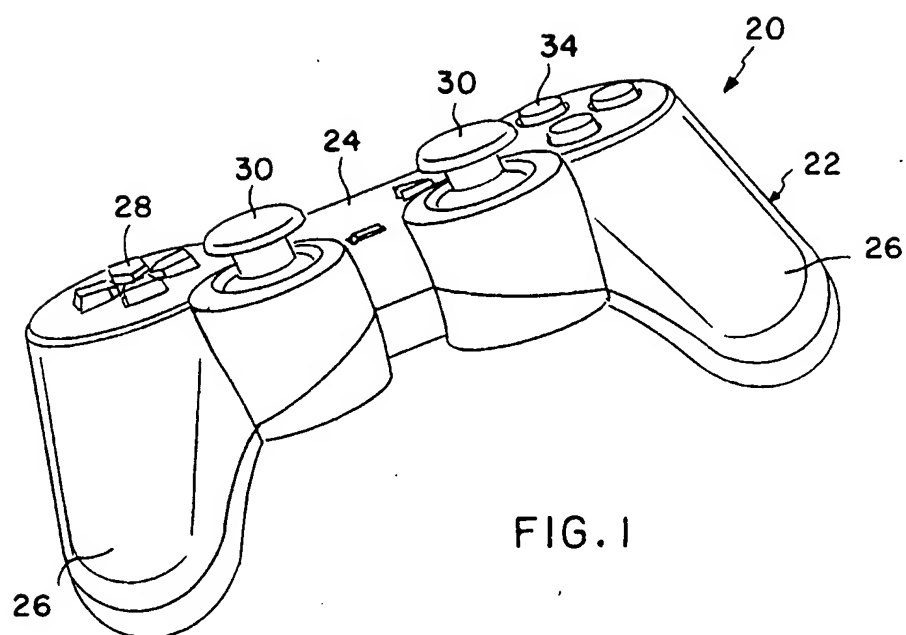


FIG. 1

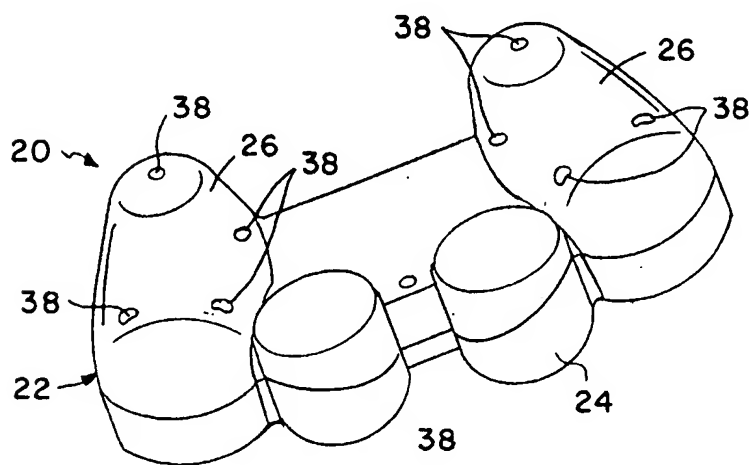


FIG. 2

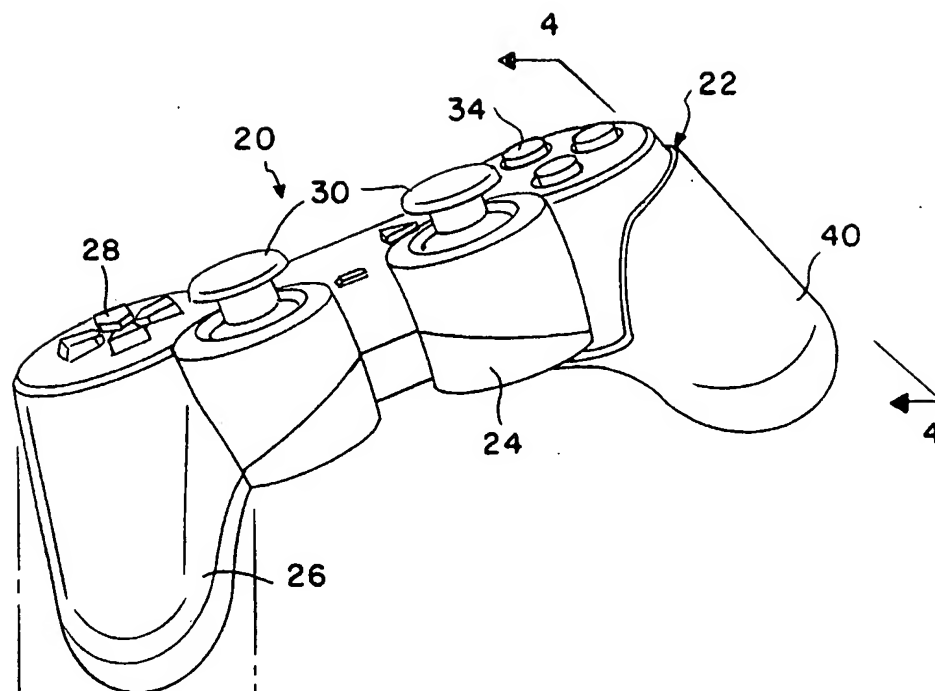


FIG. 3

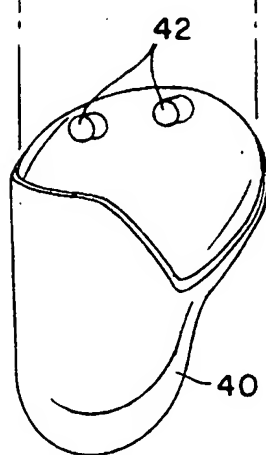
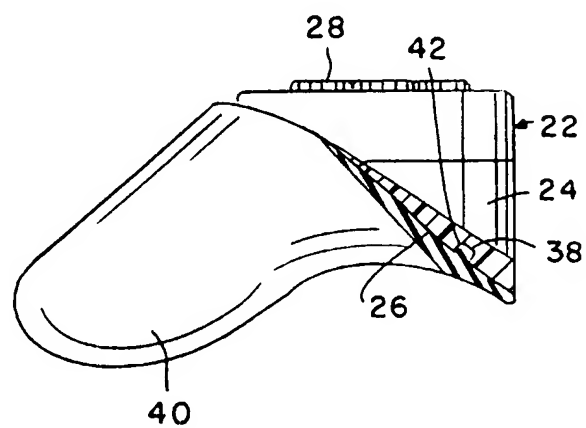


FIG. 4





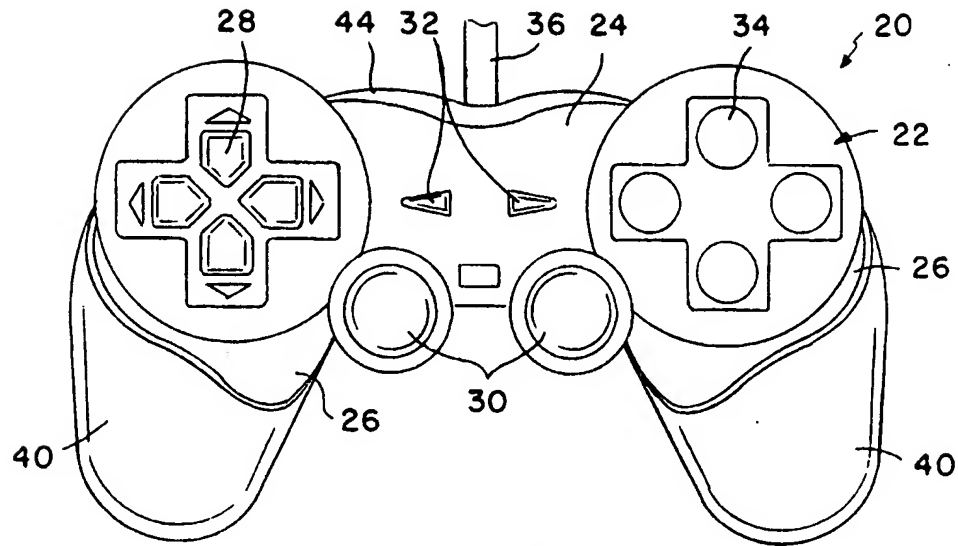


FIG. 5

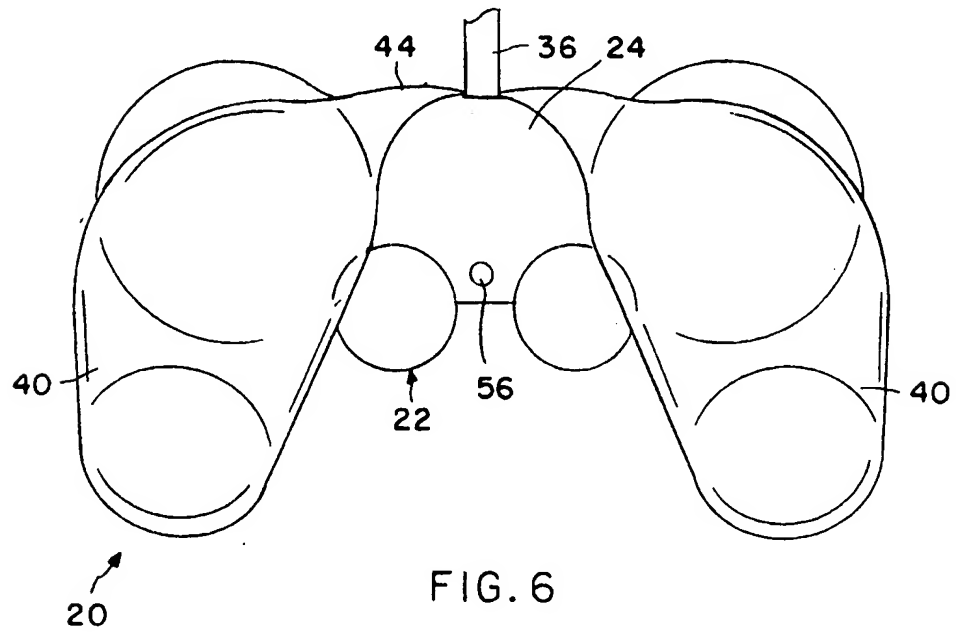
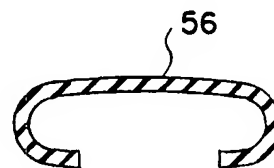
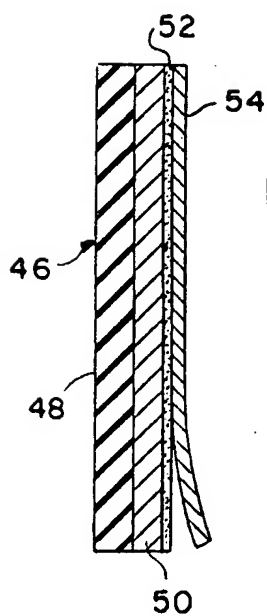
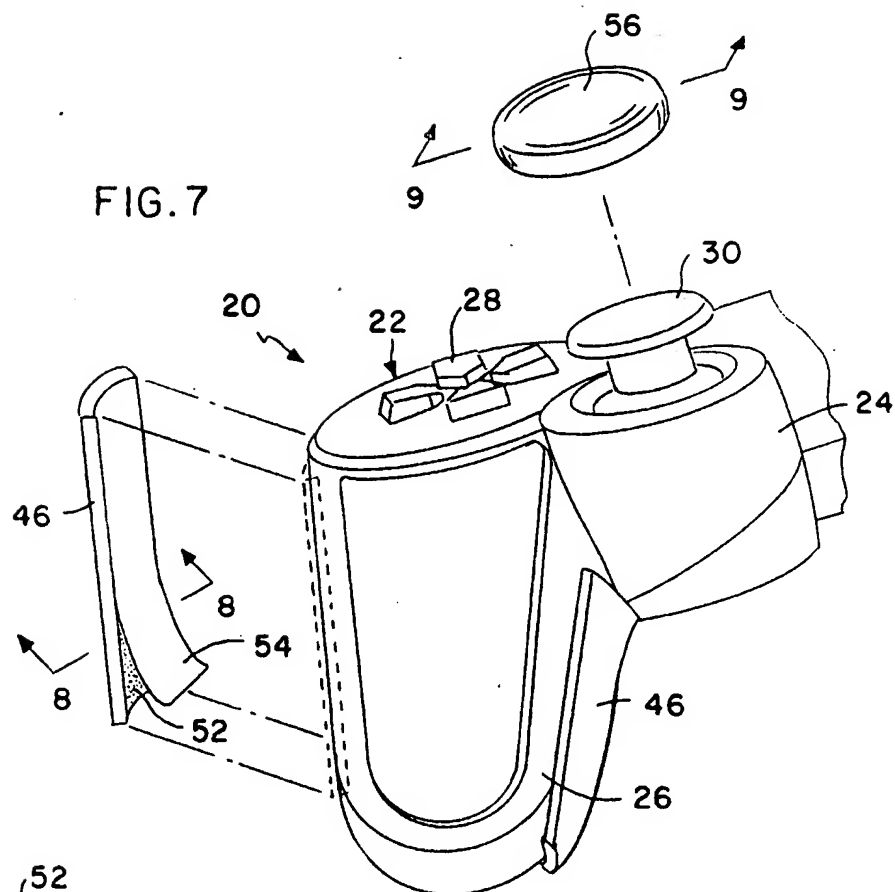


FIG. 6



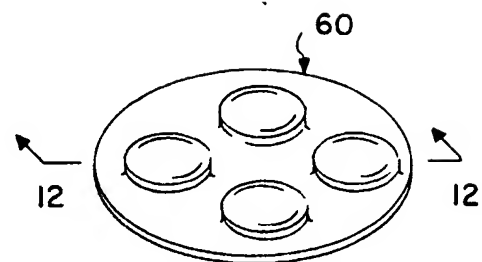
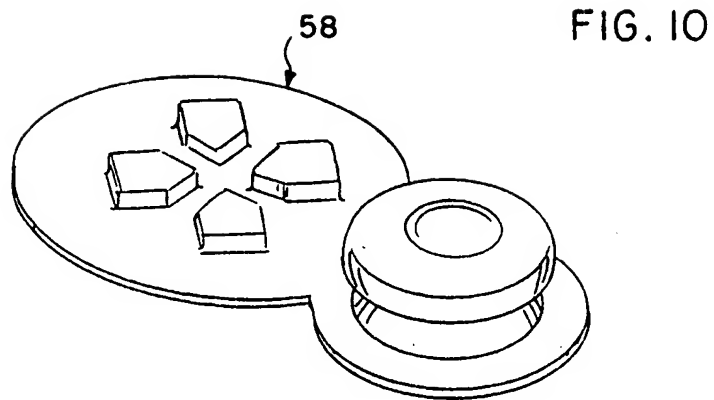


FIG. 11

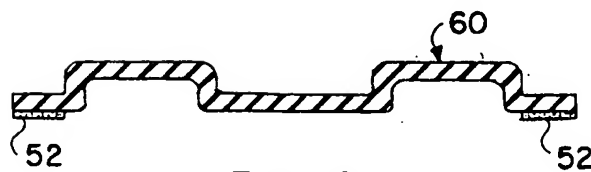


FIG. 12

FIG. 13

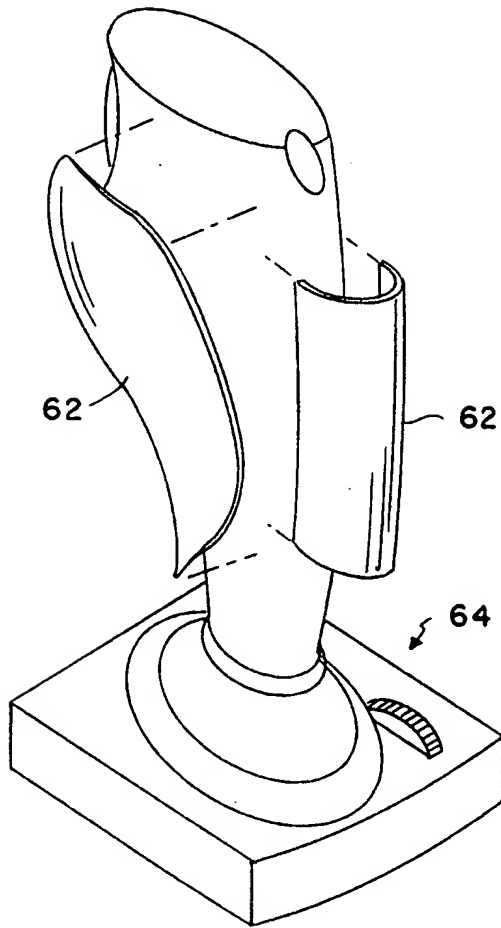
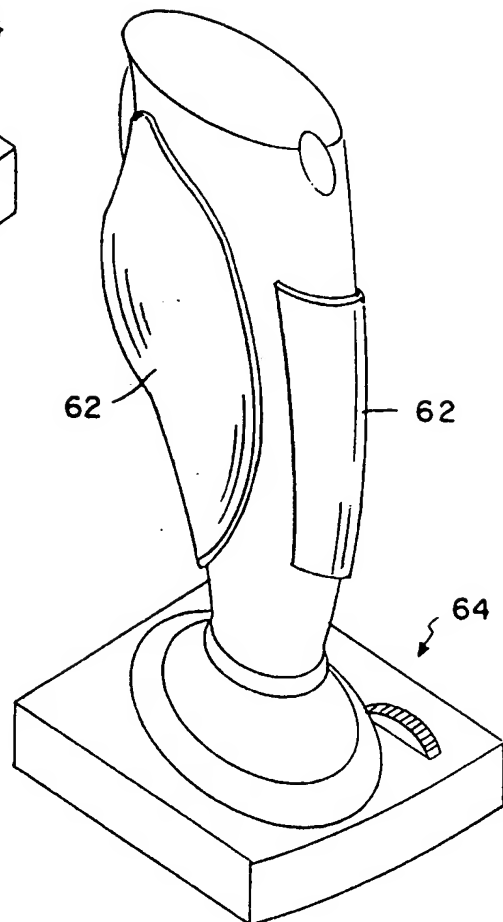


FIG. 14



7/8

FIG.15

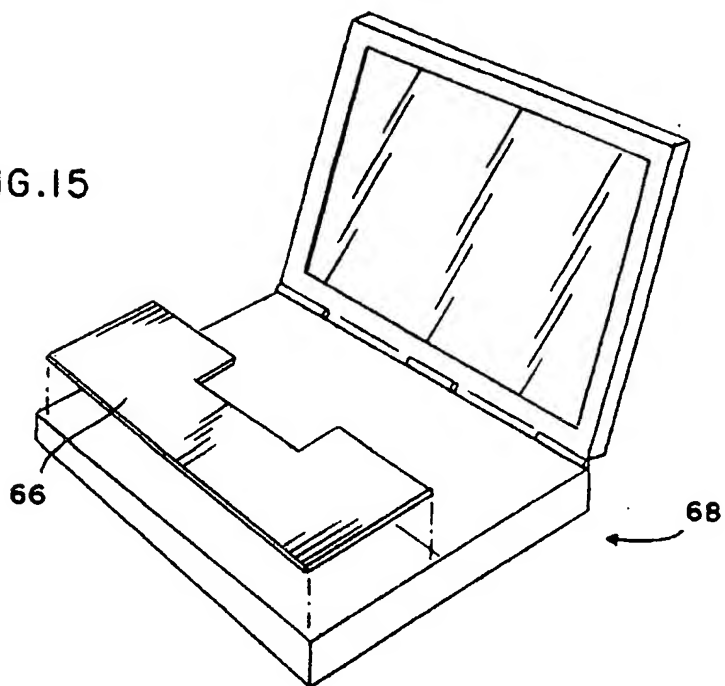
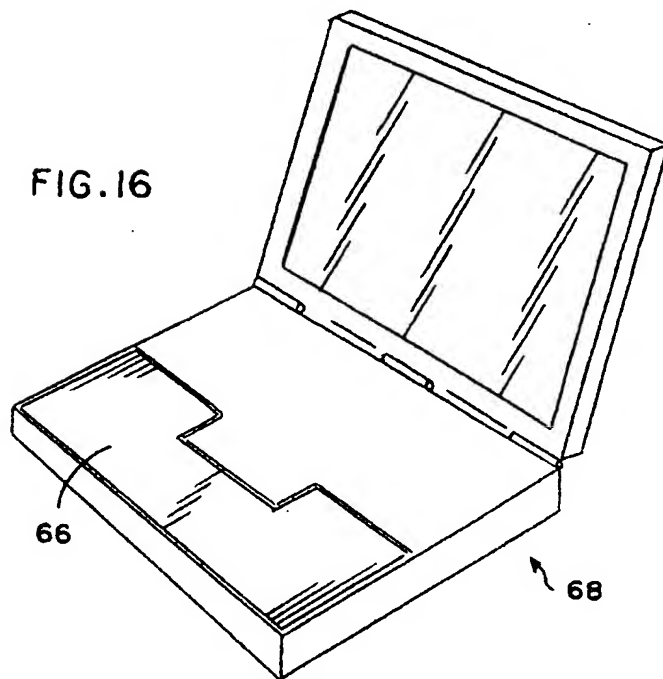


FIG.16



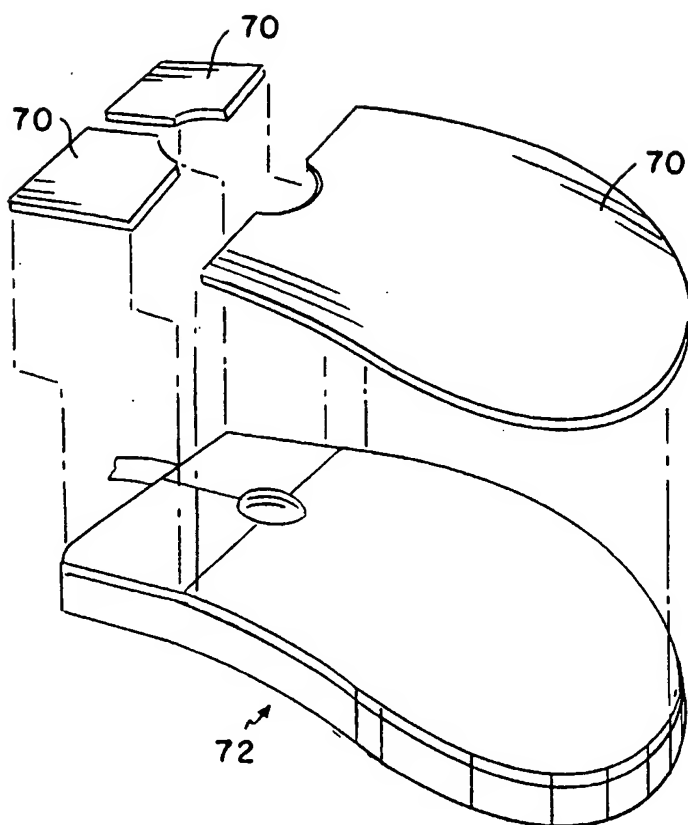


FIG. 17

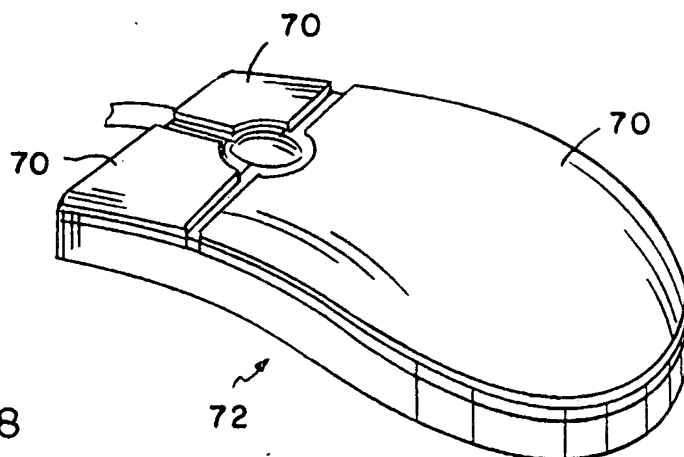


FIG. 18

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US99/00171**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(6) : Please See Extra Sheet.

US CL : 273/148B

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 273/148B; 463/36, 37, 38, 46, 47; 345/163; 2/181.4

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NONE

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,501,458 A (MALLORY) 26 March 1996, See Figures 1,4,5.	1,3-5,10,14,15
---		-----
Y		2
Y	US 5,025,504 A (BENSTON et al.) 25 June 1991, See Fig. 4.	2
X	US 5,046,739 A (REICHOW) 10 September 1991, See Figures 1-8.	1,3,5-8,14, 16-18



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

Date of mailing of the international search report

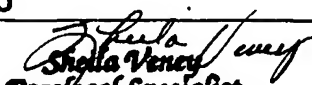
29 MAR 1999

Name and mailing address of the ISA/US  
Commissioner of Patents and Trademarks  
Box PCT  
Washington, D.C. 20231

Facsimile No.

Authorized officer

Telephone No.

  
**Sheila Vencey**  
**Paralegal Specialist**  
**Technology Center 3700**

**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/US99/00171

**A. CLASSIFICATION OF SUBJECT MATTER:**

IPC (6): A63B 71/ 00